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10/682,196	10/10/2003	Dorel Ioan Toma	243414US6YA	1260
22850	7590	04/04/2007		
OBLON, SPIVAK, MCCLELLAND, MAIER & NEUSTADT, P.C. 1940 DUKE STREET ALEXANDRIA, VA 22314			EXAMINER NGUYEN, THANH T	
			ART UNIT	PAPER NUMBER
			2813	

SHORTENED STATUTORY PERIOD OF RESPONSE	NOTIFICATION DATE	DELIVERY MODE
3 MONTHS	04/04/2007	ELECTRONIC

**Please find below and/or attached an Office communication concerning this application or proceeding.**

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Notice of this Office communication was sent electronically on the above-indicated "Notification Date" and has a shortened statutory period for reply of 3 MONTHS from 04/04/2007.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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## Office Action Summary

Application No.

10/682,196

Applicant(s)

TOMA ET AL.

Examiner

Thanh T. Nguyen

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 4/3/06.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-48 is/are pending in the application.
- 4a) Of the above claim(s) 30-48 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-29 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_

## **DETAILED ACTION**

### ***Election/Restrictions***

Applicant's election with traverse of Group I, species I, claims 1-29, 45-47 in the reply filed on 4/3/06 is acknowledged. The traversal is on the ground(s) that the species as closely related to one another to the point of justify the a common examination. This is not found persuasive because claims 1-29, method of treating a dielectric film is in claim 438, while claims 32-47, the processing system for treating film on a substrate is in class 427. Therefore, there is no reason why a search for first species must include a search for the second species as well. The existence of two distinct species, as well as the different classification of two inventions, provide evidence of burden on the examiner in examining both inventions.

Since claims 1-29 are patentable distinct from claims 32-47. The distinctness between a process of making one species to other species made is shown." MPEP § 806.04(f). Serious burden on the examiner is shown according to the criteria of MPEP § 808.02, where one of the following must be supported by appropriate explanation:

1. Separate classification thereof:

This shows that each distinct subject has attained recognition in the art as a separate subject for inventive effort, and also a separate field of search,. Patents need not be cited to show separate classification.

2. A separate status in the art when they are classifiable together;....
3. A different field of search ....

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In the restriction requirement of November 15, 2005, the examiner set forth separate classifications for the two inventions to which claims were presented. Classification of the device claims is in class 257. Classification of the process claims is in class 438 and there is no generic species. Applicant has not alleged that either device or process claims were improperly classified. Nor has applicant alleged that the classifications set forth are not "separate classifications." Thus requirement 2. of MPEP § 803 is met. For these reasons set forth above, the restriction requirement is proper.

The requirement is still deemed proper and is therefore made FINAL.

It is further noted that claims 45-47 are withdrawn from consideration because claims 45-47 do not read on the elected species I.

#### ***Oath/Declaration***

Oath/Declaration filed on 10/12/04 has been considered.

#### ***Specification***

The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

#### ***Claim Rejections - 35 USC § 102***

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The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

*1-10, 13, 15-19, 21-24, 26-29*

Claims ~~1~~ are rejected under 35 U.S.C. 102(b) as being anticipated by Yokoyama et al.

(U.S. Patent No. 2001/0019857).

Referring to figures 8a-8e; Yokoyama et al. teach a method of treating a dielectric film comprising:

exposing at least one surface of the dielectric film (38) to a  $C_xH_y$  containing material (see paragraphs# 62-64), wherein:

x and y are each integers greater than or equal to a value of unity (see paragraphs# 62-64), and the dielectric film (38, HSQ) has a dielectric constant value less than the dielectric constant of  $SiO_2$  (HSQ is a low k dielectric material which has a lower dielectric constant than  $SiO_2$ , It is also noted that the same material would provide the same result).

Regarding to claim 2, exposing the at least one surface of the dielectric film (38) to at least one of a **nitrogen containing material** and a chlorine containing material (see para# 62-63).

Regarding to claim 3, wherein the exposing the dielectric film (38) comprises exposing a dielectric film (38, HSQ) having a dielectric constant ranging from 1.6 to 2.7 (noted that HSQ has dielectric constant of 2.5-3.0).

Regarding to claim 4, wherein the exposing the dielectric film (38) comprises exposing at least one of a porous dielectric film, and a non-porous dielectric film (HSQ is non-porous because it is not mention that it is porous).

Regarding to claim 5, wherein the exposing the porous dielectric film comprises exposing at least one of a single-phase material, and a dual-phase material (38, HSQ).

Regarding to claim 6, wherein the exposing the dielectric film (38, HSQ) comprises exposing a film including at least one of an organic material, and an inorganic material (HSQ).

Regarding to claim 7, wherein the exposing a film (38) comprises exposing a film including an inorganic-organic hybrid material (HSQ).

Regarding to claim 8, wherein the exposing a film (38) comprises exposing a film including an oxidized organo silane (HSQ).

Regarding to claim 9, wherein the exposing a film (38) comprises exposing a film including at least one of hydrogen silsesquioxane, and methyl silsesquioxane (HSQ, see paragraph# 62-63).

Regarding to claim 10, wherein the exposing a film (38) comprises exposing a film including a silicate-based material (38, HSQ).

Regarding to claim 13, wherein the exposing the dielectric film to  $C_xH_y$  containing material comprises introducing the  $C_xH_y$  containing material in at least one of vapor phase, liquid phase, and within a supercritical fluid (see paragraph# 62-64).

Regarding to claim 15, wherein the exposing the dielectric film to the  $C_xH_y$  containing material comprises exposing the dielectric film to at least one of a  $CH_2$  containing material, and a  $CH_3$  containing material (see para# 62-64).

Regarding to claim 17, wherein the exposing the dielectric film to the  $C_xH_y$  containing material comprises exposing the dielectric film to at least one of hexamethyldisilazane (HMDS), trimethyldisilazane (TMDS), chlorotrimethylsilane (TMCS), trichloromethylsilane (TCMS),  $[C_{sub.6}H_{sub.5}Si(CH_{sub.3})_{sub.2}]_{sub.2}NH$ ,  $C_{sub.15}H_{sub.29}NSi$ ,  $(CH_{sub.3})_{sub.2}NH$  Dimethylamine, and  $H_{sub.2}N(CH_{sub.2})_{sub.3}Si(OC_{sub.2}H_{sub.5})_{sub.3}$  3-Aminopropyltriethoxysilane (see para# 62-64).

Regarding to claim 18, heating the dielectric film on the substrate to a temperature ranging from 50 C to 400 C (see para# 60).

Regarding to claim 19, wherein exposing the dielectric film to the  $C_xH_y$  containing material facilitates at least one of healing the dielectric film, sealing the dielectric film, and cleaning the dielectric film (see para# 61-64).

Regarding to claim 21, a method of producing a dielectric film (38) on a substrate (31) comprising: forming the dielectric film (38) on the substrate (31); forming a mask (39a) on the dielectric film (38); forming a pattern in the mask (39a, see figure 8a); forming at least one feature (see figure 8a) in the dielectric film (38) by transferring the pattern in the mask (39a) to the dielectric film (38); and exposing a sidewall of the feature (see figure 8c) in the dielectric film (38) to a treating compound, the treating compound comprises a  $C_xH_y$  containing material, wherein x and y are each integers greater than or equal to unity (see figure 8c, para# 62-64).

Regarding to claim 22, exposing the sidewall of the feature to the treating compound, wherein the treating compound further comprises at least one of a N-containing material and a Cl-containing material (see figures 8C, para# 62-63).

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Regarding to claim 23, further comprising: heating the dielectric film on the substrate to a temperature ranging from 50 C to 400 C (see para# 60).

Regarding to claim 24, wherein the exposing the sidewall of the feature to the  $C_xH_y$  containing material comprises exposing the sidewall of the feature to at least one of a CH.sub.2 containing material, and a CH.sub.3 containing material (see para# 62-64).

Regarding to claim 26, wherein the exposing the sidewall of the feature in the dielectric film to the healing compound comprises exposing the dielectric film to at least one of hexamethyldisilazane (HMDS), trimethyldisilazane (TMDS), chlorotrimethylsilane (TMCS), trichloromethylsilane (TCMS)[C.sub.6H.sub.5Si(CH.sub.3).sub.2].sub.2NH, C.sub.15H.sub.29NSi, (CH.sub.3).sub.2NH Dimethylamine, and H.sub.2N(CH.sub.2).sub.3Si(OC.sub.2H.sub.5).sub.3 3-Aminopropyltriethoxysilane (see para# 62-64).

Regarding to claim 27, A method of treating a dielectric film (38) comprising exposing the dielectric film (38) to a treating compound, the treating compound comprises a  $C_xH_y$  containing material, wherein x and y are each integers greater than or equal to unity (see figure 8c, para# 62-64).

Regarding to claim 28, further comprising: exposing the dielectric film to the treating compound, wherein the treating compound further comprise at least one of a N-containing material and a Cl-containing material (see para# 62-63).

Regarding to claim 29, wherein exposing the dielectric film to the treating compound facilitates at least one of healing the dielectric film, sealing the dielectric film, and cleaning the dielectric film (see para# 61-64).

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which the subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 11-12, 14, 20, 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yokoyama et al. (U.S. Patent No. 2001/0019857) as applied to claims 1-10, 13, 15-19, 21-24, 26-29 above, in view of Lin et al. (U.S. Patent No. 6,875,709) and Kane et al. (U.S. Patent No. 6,670,717).

Yokoyama et al. teach a method of treating the dielectric film (HSQ) by using CH containing material. However, the reference does not teach dielectric film comprising silicon, carbon and oxygen, introducing the C<sub>x</sub>H<sub>y</sub> containing material within supercritical carbon dioxide, exposing the surface of the dielectric film to a second C<sub>x</sub>H<sub>y</sub> containing material comprises exposing the dielectric film to TMCTS or OMCTS.

Lin et al. teaches dielectric film comprising silicon, carbon and oxygen (methyl silsesquioxane, see col. 6, lines 24-28), introducing the C<sub>x</sub>H<sub>y</sub> containing material within supercritical carbon dioxide (see col. 8, lines 43-61), exposing the at least one surface of the dielectric film to a first C<sub>x</sub>H<sub>y</sub> containing material and to a second C<sub>x</sub>H<sub>y</sub> containing material (see col. 8, lines 43-61).

Therefore, it would have been obvious to a person of ordinary skill in the requisite art at the time of the invention was made would dielectric film comprising silicon, carbon and

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oxygen, introducing the  $C_xH_y$  containing material within supercritical carbon, exposing the at least one surface of the dielectric film to a first  $C_xH_y$  containing material and to a second  $C_xH_y$  containing material in process of Yokoyama et al. as taught by Lin et al. because forming a dielectric layer comprising silicon, carbon and oxygen (MSQ) would provide a film with low dielectric constant, exposing the dielectric film with supercritical carbon dioxide, first and second  $C_xH_y$  containing material to cure dielectric film and remove all the undesirable residual form on the surface of the layer.

Kane et al. exposing dielectric film to TMCTS or OMCTS (see col. 1, lines 20-29).

Therefore, it would have been obvious to a person of ordinary skill in the requisite art at the time of the invention was made would expose dielectric film to TMCTS in process of Yokoyama et al. as taught by Kane et al. because the process would cure dielectric film by etching film.

### ***Double Patenting***

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting

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ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

Claims 1-29 are provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-25 of copending Application No.

11/060352. Although the conflicting claims are not identical, they are not patentably distinct from each other because both the instant invention and the copending application teach a method of treating the dielectric film with  $C_xH_y$  containing material.

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

### *Conclusion*

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thanh Nguyen whose telephone number is (571) 272-1695, or by Email via address Thanh.Nguyen@uspto.gov. The examiner can normally be reached on Monday-Thursday from 6:00AM to 3:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead, Jr., can be reached on (571) 272-1702. The fax phone number for this Group is (571) 273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished

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applications is available through Private PAIR only. For more information about the PAIR system, see <http://pairedirect.uspto.gov>. Should you have questions on access to thy Private PAIR system, contact the Electronic Business center (EBC) at 866-217-9197 (toll-free).

A handwritten signature in black ink, appearing to read 'Thanh', with a stylized flourish extending to the right.

Thanh Nguyen  
Patent Examiner  
Patent Examining Group 2800

TTN